Fachverband Gebäude-Klima e.V.

Ventilation and Air-conditioning:

Market and requirements

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Managing Director

About Fachverband Gebäude-Klima (FGK)

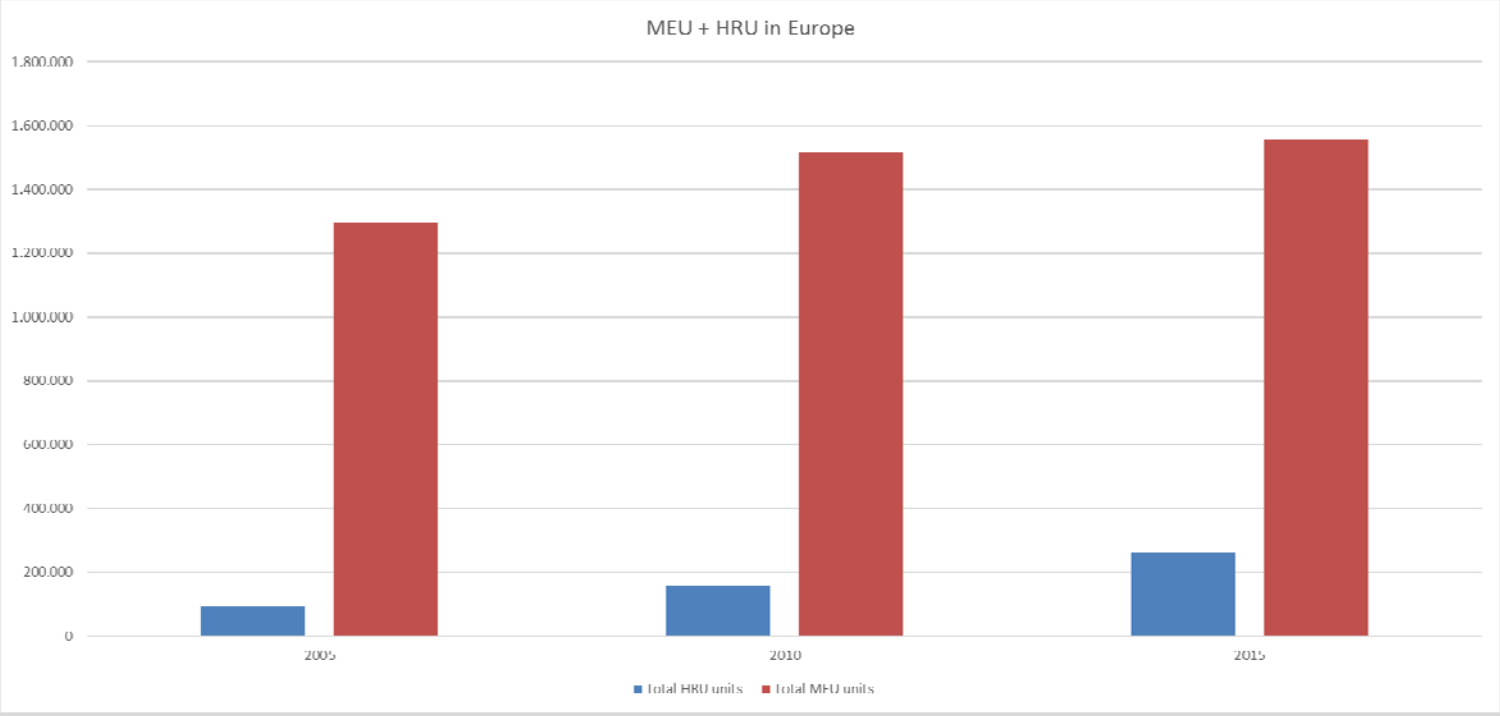
- Leading association of the air-conditioning and ventilation industry in Germany
- Established 1970
- Located in Berlin and Baden-Wuerttemberg
- 300 member companies: component manufacturers, technical planners and consulting engineers, distributors, plant manufacturers, facility managers, associations and institutions
- Representation of all business segments – from residential ventilation to cleanroom technology
- Turnover 2015 approx. € 6.5 bn; approx. 45,000 employees

About Fachverband Gebäude-Klima (FGK)

- Working Groups:
  - Room-climate effect
  - Evaluation methods
  - Fans
  - Energy-efficient room air-conditioning systems and heat pumps
  - Residential ventilation
  - Maintenance and cleaning of ventilation and air-conditioning systems
  - Air moistening
  - Heat and cold recovery
  - Air ducts
- International Partner Associations:
  - EVIA - European Ventilation Industry Association
  - EPEE - European Partnership for Energy and Environment

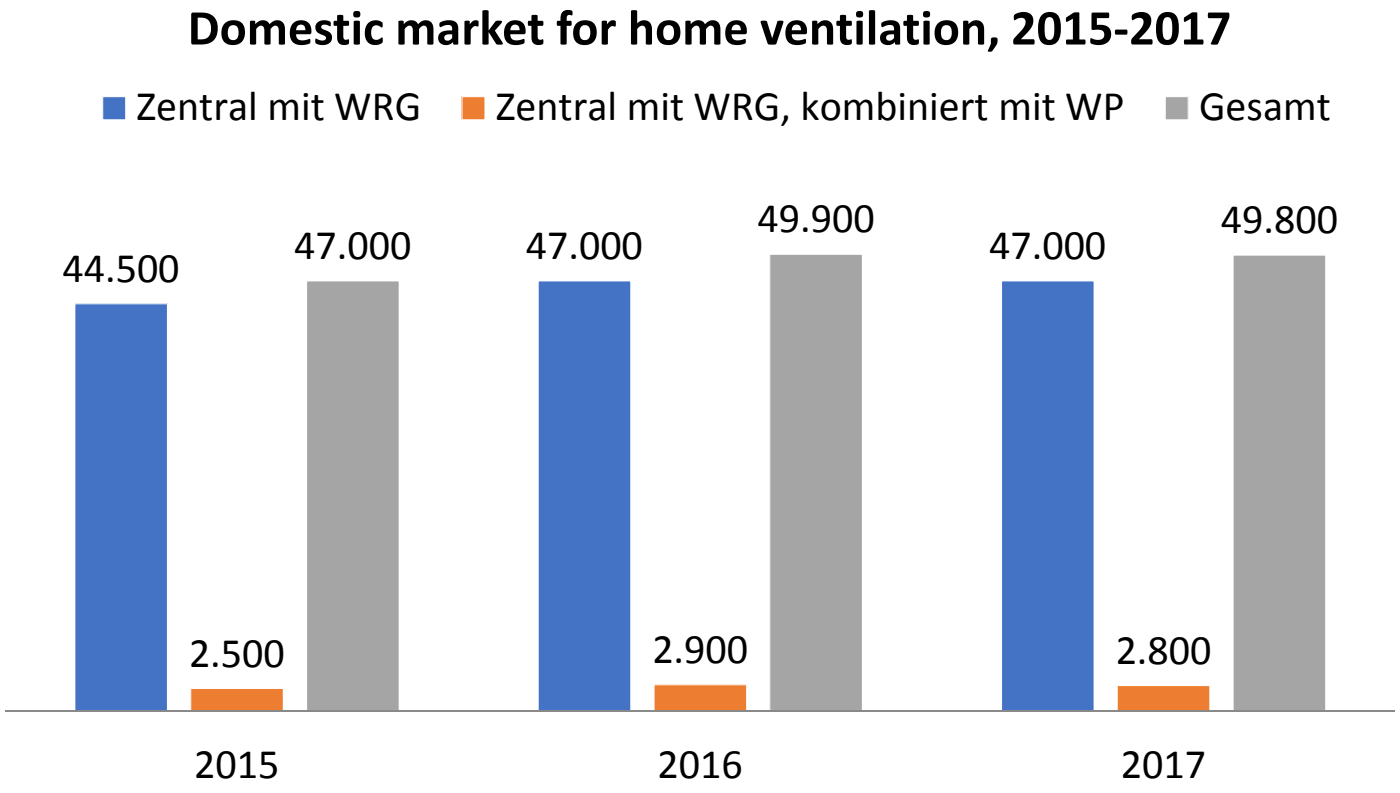
Trend residential units with heat recovery for a single dwelling in Europe

- Growing market
- Mechanical extraction units are dominant in Europe

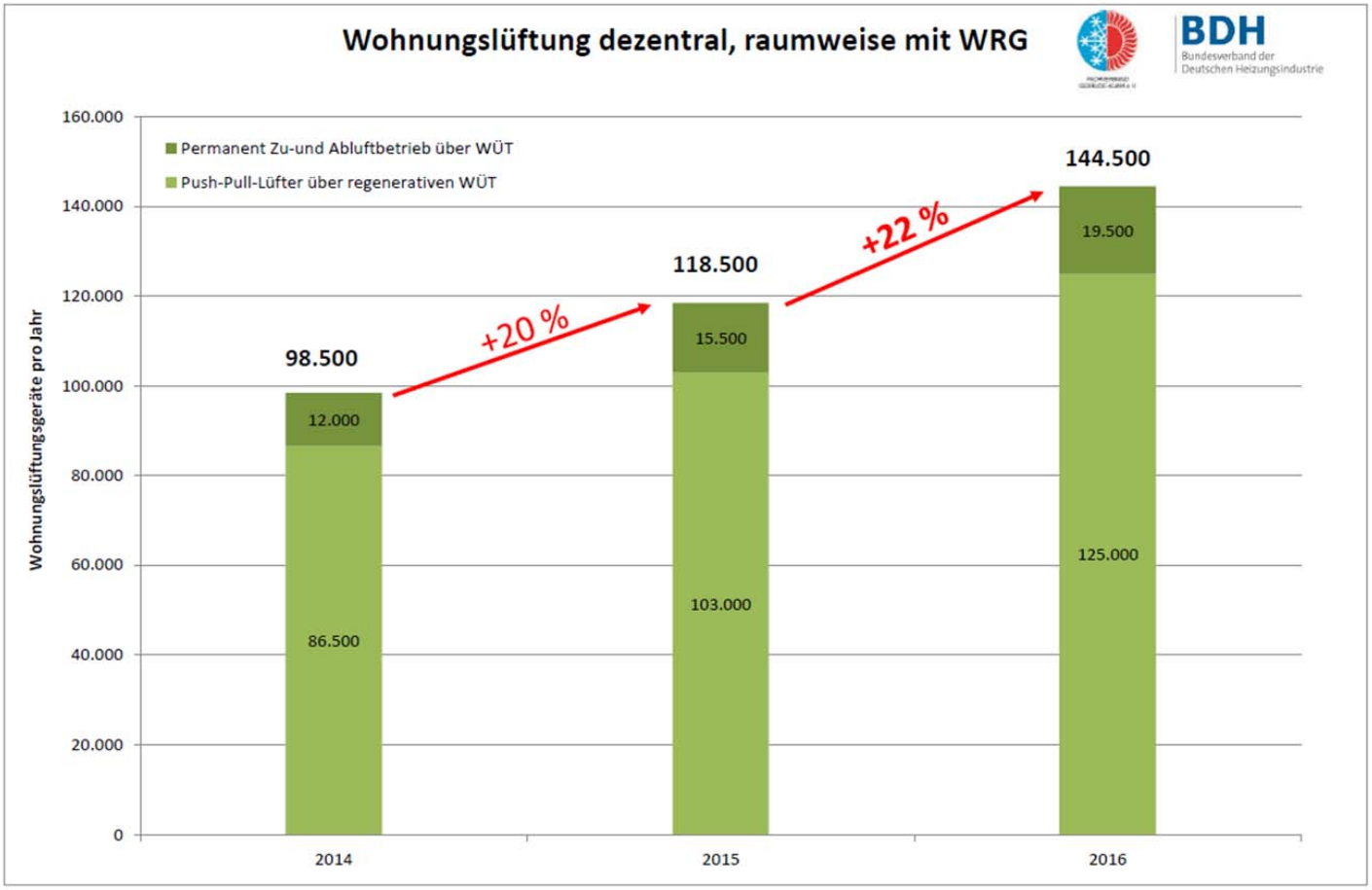


MEU: Mechanical extraction unit
HRU: Heat recovery unit

Market development: central residential ventilation with heat recovery



Market development: decentralized, room by room



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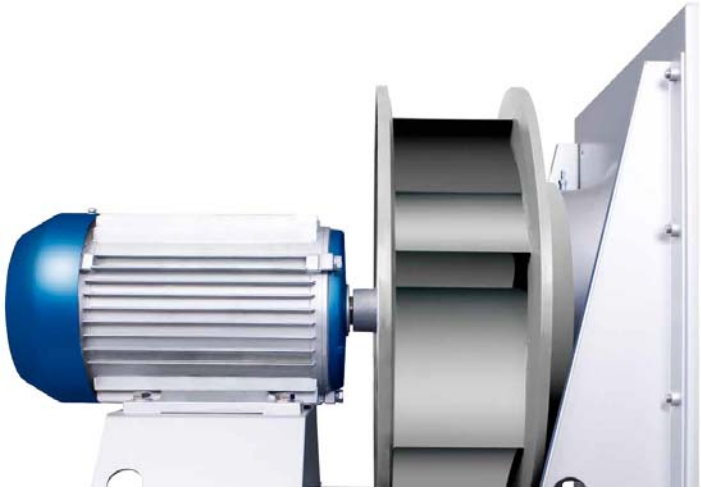
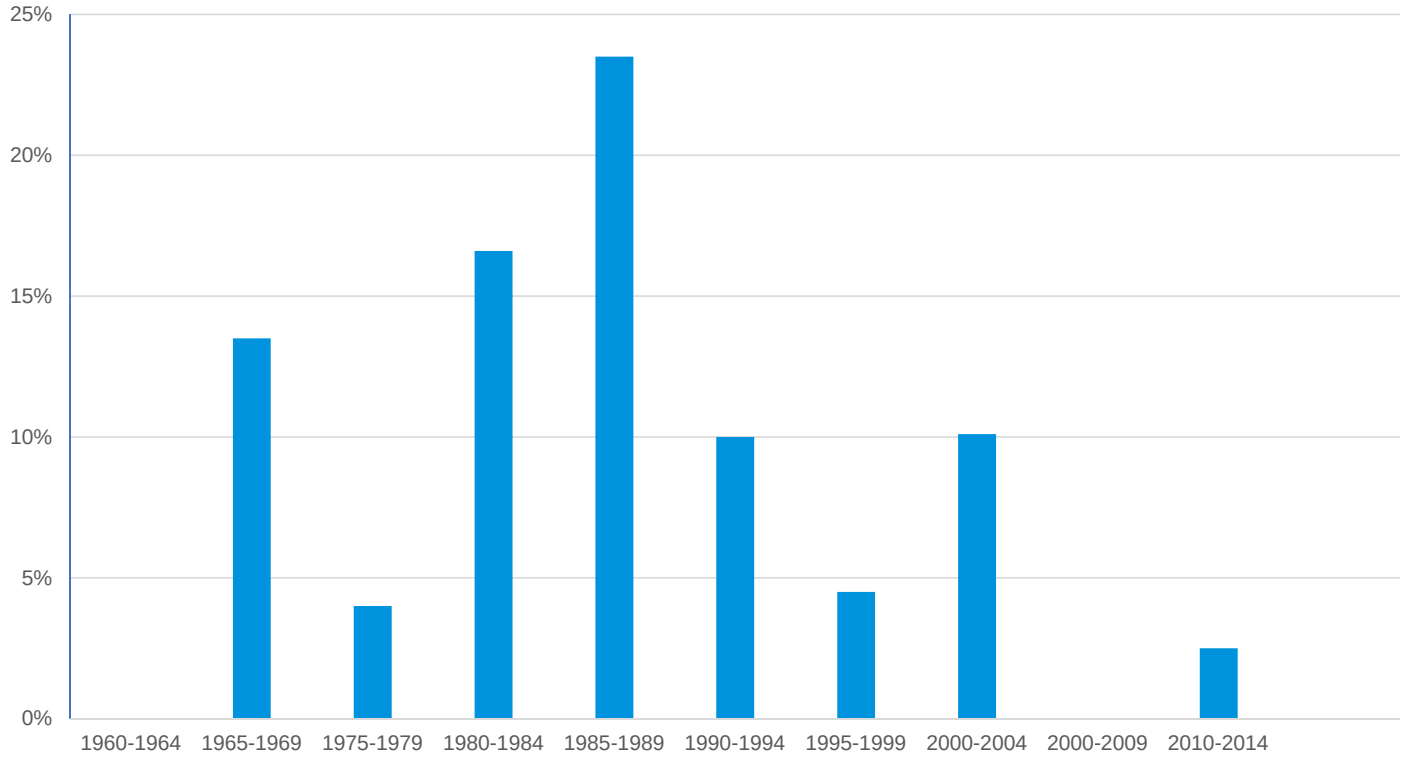
Air-handling units 2017: manufacturers in Germany

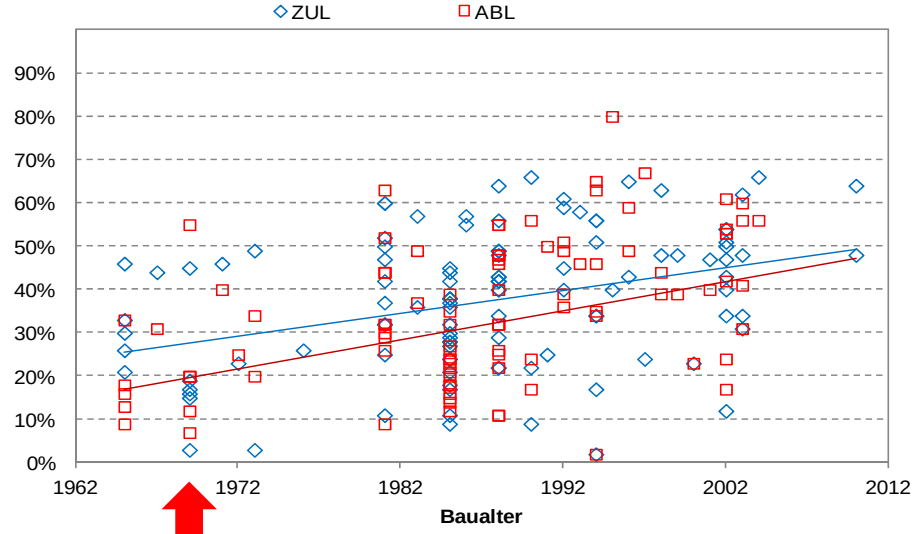
- Turnover: € 810 million
- Units: 84,000



Age distribution of inspected air-conditioning systems



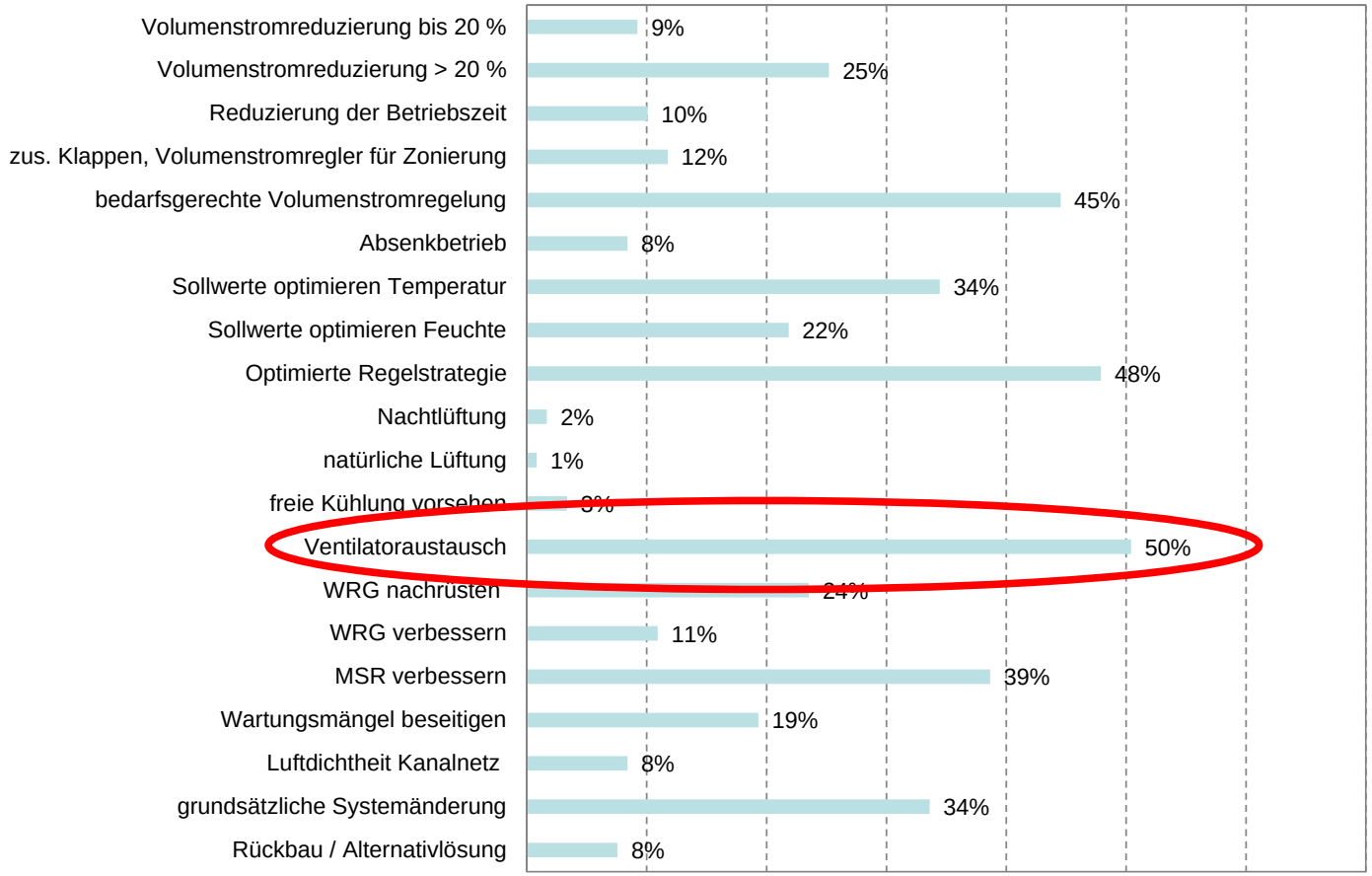
Fan system efficiencies depending on the year of construction



Problematic cases

	Weighted on mean, based on inspections	Benchmark
Supply air	42 %	70 %
Exhaust air	38 %	70 %

Fan exchange: status quo and savings potential



Energy savings

- Estimated savings based on ErP Regulation in 2020
- EU 326/2011 fans
- EU 1253/2014 ventilation units
- Better IAQ
- Less energy

Product	End energy	Primary Energy
Residential ventilation (Heating)	222 TWh	244 TWh
Ventilation NR – Heating	150 TWh	165 TWh
Ventilation NR – Electricity	16 TWh	40 TWh
Ventilation NR – Cold	8 TWh	8 TWh
Fans – all Applications	34 TWh	82 TWh
Total 2020		**539 TWh**
Demand EU 27		~20,000 TWh
Savings Potential		2-3%

Best practice: fan exchange campaign

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Renovation of the ventilation system of an office building, Ingolstadt

- 18 new radial EC fans
- Holistic optimization of the air-conditioning systems
- Elimination of silencers through acoustic improvement
- CO_2 savings: 40.1 tons/year
- Cost saving: € 10,577 /year
- Investment costs: € 28,350 (fans and conversion costs)
- Amortization period: 1.7 years, 2.7 years (incl. conversion work)

Best Practice: fan exchange campaign

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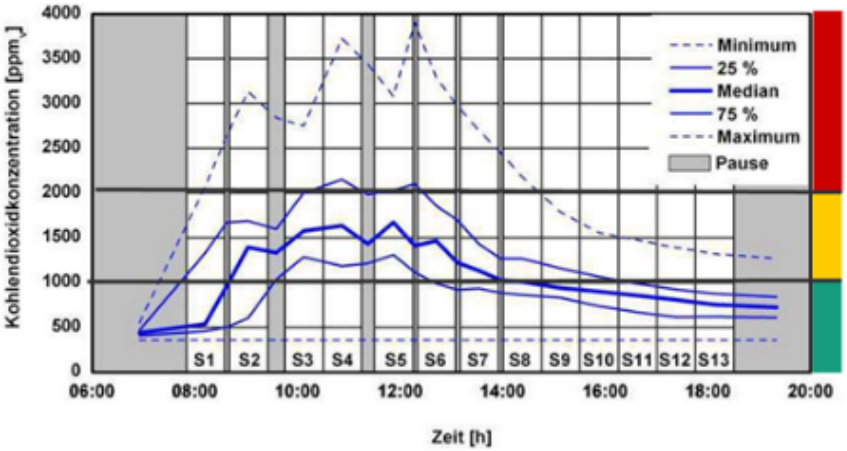
Retrofit for EC centrifugal fans: supply-air system for Media-Markt, Berlin

- 6 new fans
- 70 percent reduction in energy costs
- Duration of implementation 3 months
- High degree of efficiency
- Low noise level
- Low operating costs
- Total air flow: 77,000 m³/h at 1,224 Pa
- CO_2 savings: 70%.
- Cost saving: € 13,284 / year
- Amortization period: 1 year

CO_2 as an indicator: UBA Guideline on CO_2 in schools

CO_2 concentration [ppm]	Hygiene assessment		Recommendations
< 1000	Acceptable		No further requirements
1000 - 2000	Noticeable conspicuous		Consider further ventilation actions: Raise ventilation rate, improve ventilation
> 2000	Not acceptable		Check possibilities of ventilation Check further solutions



Measurement CO_2 in existing schools
Hellwig, Antretter, Holm, Sedlbauer, Fraunhofer ISE, 2009

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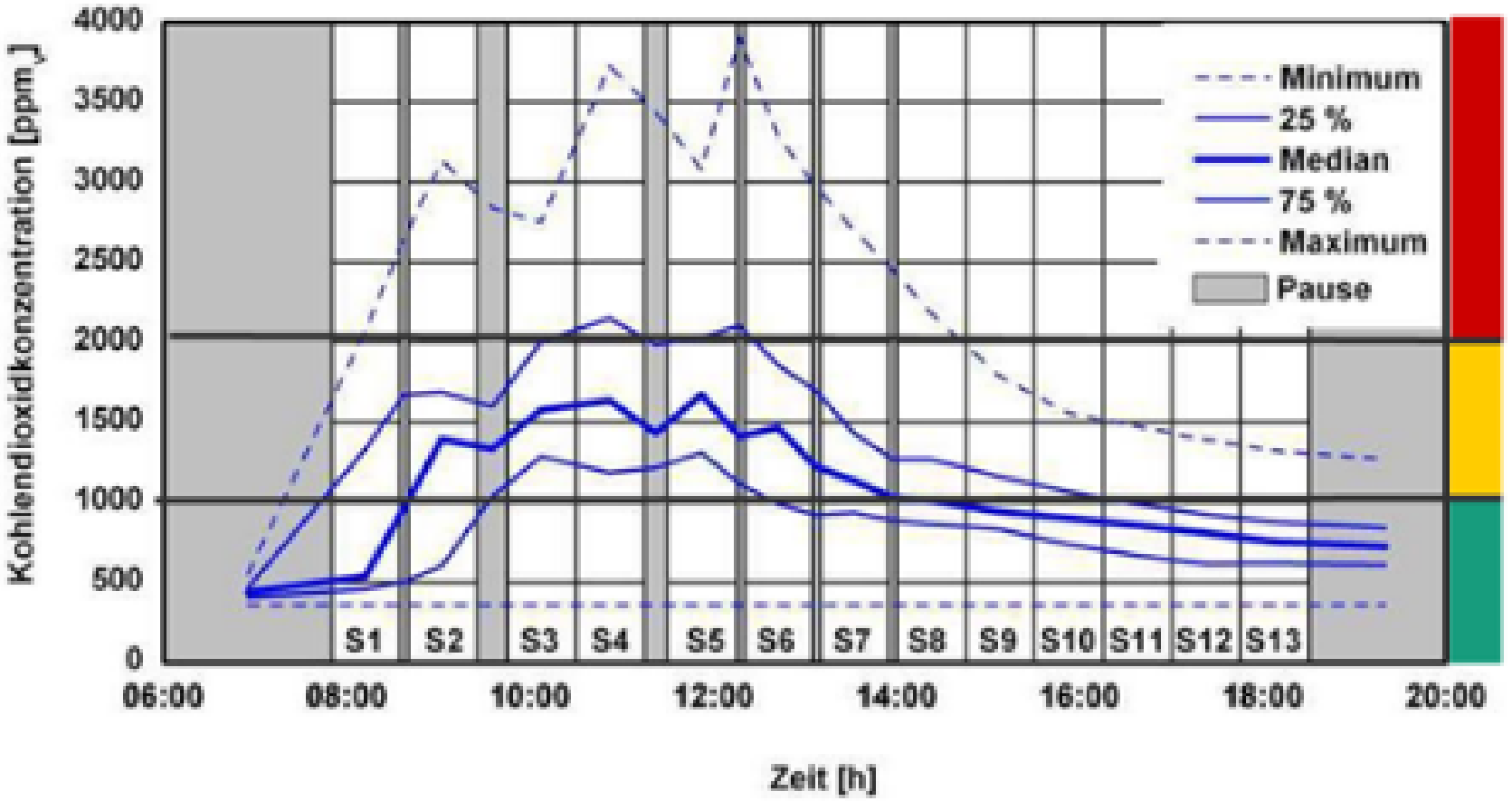

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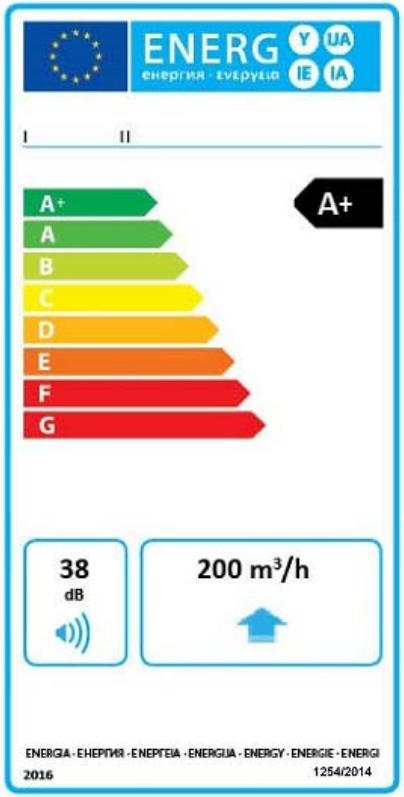
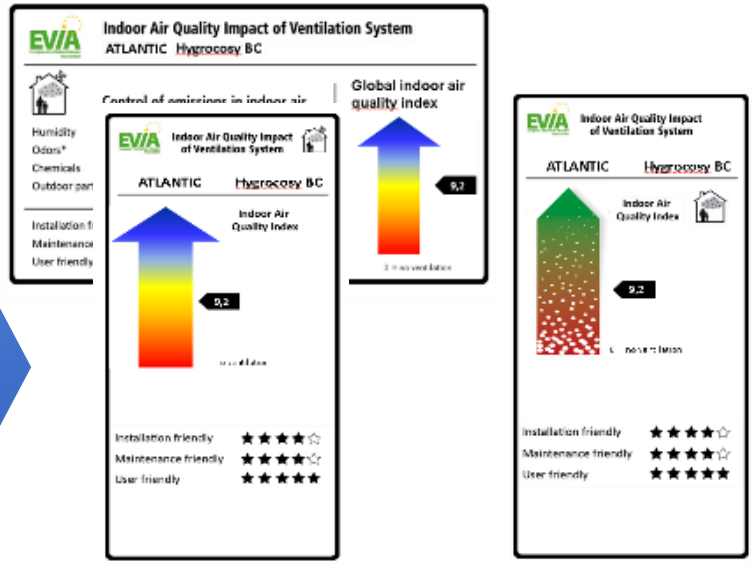
Currently in ErP Label:
No indicator in energy labelling of ventilation units

- Moisture removal
- Winter comfort
- Particle removal
- VOC and odours removal
- CO_2 level





EVIA's mission in EPBD review

- EVIA recommends that the following aspects shall be considered in the revision of EPBD:
  - Requirements on indoor air quality and thermal comfort
  - Regular inspections of ventilation systems
  - The use of demand controlled options
  - The use of heat recovery as a waste energy technology
- Nearly zero-energy buildings need a dedicated ventilation system to avoid negative effects such as bad indoor air quality caused by inadequate ventilation.
- This can be made with minor changes in the regulation.

Indoor environment quality -> indoor air quality

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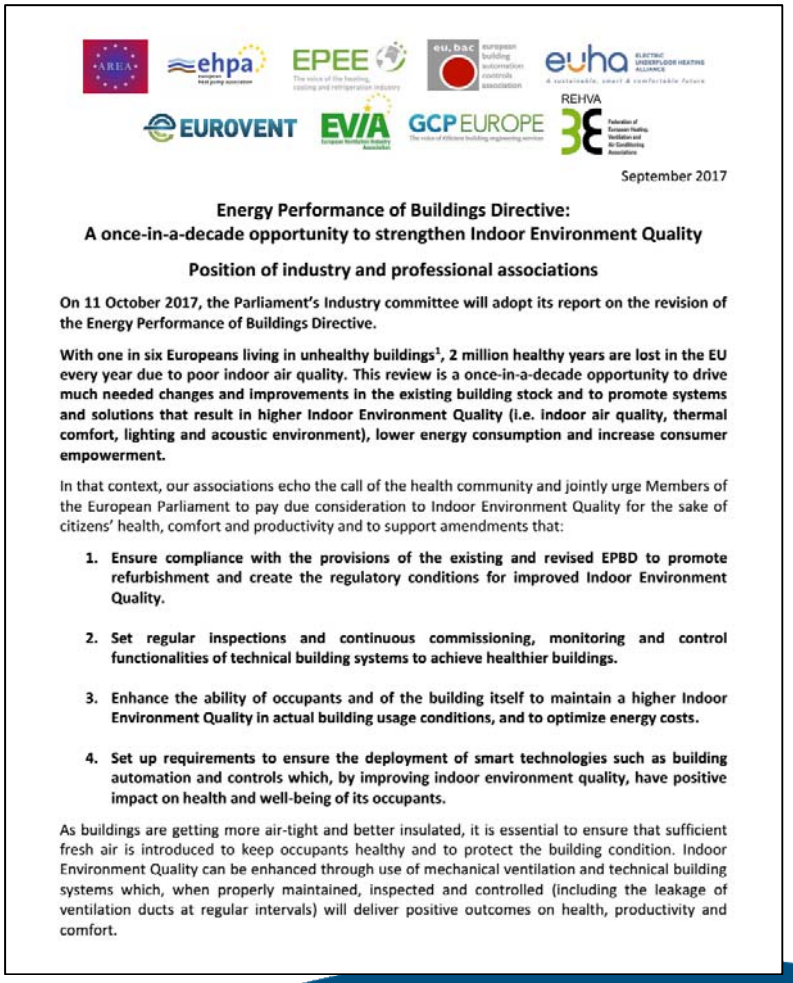
- Light
- Acoustic
- Smartness
- Thermal comfort
  - Summer/winter temperature/h
  - Draft risk
- Indoor air quality - ventilation rate
  - The right amount
  - At the right time
  - At the right place
- Regular inspections to ensure functionally and
- Minimum energy consumption



September 2017

Energy Performance of Buildings Directive:
A once-in-a-decade opportunity to strengthen Indoor Environment Quality

Position of industry and professional associations

On 11 October 2017, the Parliament's Industry committee will adopt its report on the revision of the Energy Performance of Buildings Directive.

With one in six Europeans living in unhealthy buildings[1], 2 million healthy years are lost in the EU every year due to poor indoor air quality. This review is a once-in-a-decade opportunity to drive much needed changes and improvements in the existing building stock and to promote systems and solutions that result in higher Indoor Environment Quality (i.e. indoor air quality, thermal comfort, lighting and acoustic environment), lower energy consumption and increase consumer empowerment.

In that context, our associations echo the call of the health community and jointly urge Members of the European Parliament to pay due consideration to Indoor Environment Quality for the sake of citizens' health, comfort and productivity and to support amendments that:

1. **Ensure compliance with the provisions of the existing and revised EPBD to promote refurbishment and create the regulatory conditions for improved Indoor Environment Quality.**
2. **Set regular inspections and continuous commissioning, monitoring and control functionalities of technical building systems to achieve healthier buildings.**
3. **Enhance the ability of occupants and of the building itself to maintain a higher Indoor Environment Quality in actual building usage conditions, and to optimize energy costs.**
4. **Set up requirements to ensure the deployment of smart technologies such as building automation and controls which, by improving indoor environment quality, have positive impact on health and well-being of its occupants.**

As buildings are getting more air-tight and better insulated, it is essential to ensure that sufficient fresh air is introduced to keep occupants healthy and to protect the building condition. Indoor Environment Quality can be enhanced through use of mechanical ventilation and technical building systems which, when properly maintained, inspected and controlled (including the leakage of ventilation ducts at regular intervals) will deliver positive outcomes on health, productivity and comfort.

IAQ in buildings and ventilation systems – basic aspects

- Ventilation for building protection
  - Damage prevention
  - Moisture prevention
- Indoor air quality
  - Pollutant removal
  - Perceived air quality
- Outdoor and outdoor air quality
  - Fine dust
  - Odours
  - Noise
- Hygiene aspects of ventilation systems
  - Maintenance
  - Cleaning

New article: setting of minimum indoor air-quality requirements

- Member States shall take the necessary measures to ensure that minimum indoor air-quality requirements for buildings or building units are set.
- They shall require minimum user independent ventilation airflow.
- These requirements shall take account the intended use of the building.
- Member States shall establish a methodology to calculate an indoor air-quality indicator.
  - The indoor air-quality indicator shall be reported in a transparent way in the energy performance certificate
  - The energy performance certificate shall include information about indoor air-quality (ventilation rate) and the indoor thermal environment (summer and winter).

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Example 1: **Two people in an office (A = 20 m², V = 50 m³):**

How long will it take to reach 1,000 ppm / 2,000 ppm of CO_2 in the office?

Outdoor air exchange rate	**1,000 ppm**	**2,000 ppm**
0.00 h^{-1}	37 min.	112 min.
0.25 h^{-1}	41 min.	152 min.
0.50 h^{-1}	45 min.	330 min.
1.00 h^{-1}	----	---

Example 2: **Loss of thermal energy in 120 m² home (by opening the window (outdoor air = 0 °C, room = 22 °C)**

a) Opening window
for 10 min per hour: loss = 1,200 W per hour

b) Mechanical ventilation
with heat recovery (80 %): loss = 240 W per hour

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Thank you for your attention and always stay cool with an appropriate and efficient AC system